examining the

COST OF GREEN

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DAVIS LANGDON

INTRODUCTION

Architects and clients around the world are embracing sustainable design, using their vision and skills to create buildings that give back to the environment, brightening the future for future generations. The desire to build green, however, is tempered by project realities, especially budget, and by the perception that sustainable design must always cost more.

Davis Langdon in the United States was founded in 1974 to provide comprehensive cost planning and sustainable design management services to architects and owners. The firm is part of an international consultancy delivering a complete range of project and cost management services tailed to manage client requirements, control cost, limit risk and value throughout the project development. Davis Langdon conducted an in-depth study of our current projects to analyze the cost of sustainable buildings.

'Green' buildings were compared to buildings with similar programs, but which do not have sustainable goals. Building budgets were analyzed to assess what, if any, supplemental funding was directed towards the sustainable effort.

From this analysis we conclude that many projects achieve sustainable design within their initial budget, or with very small supplemental funding. This suggests that owners are finding ways to incorporate project goals and values, regardless of budget, by making choices.

More in-depth cost comparisons and information are available in the comprehensive report, which can be downloaded from http://www.davislangdon.com, including a point-by-point comparison of costs and feasibility for all projects studied, and an introduction to the knowledgebase of cost information used to provide the project information analyzed for this study.

A MEASURE OF SUSTAINABILITY

The United States Green Building Council (USGBC)'s Leadership in Energy and Environmental Design (LEED®) rating system is useful for gauging the level of sustainability, or 'greenness' in a building. Thus, to answer the question of the cost of sustainable design, we can look to the costs involved in achieving LEED certification by comparing LEED to non-LEED buildings.

LEED provides a means to measure sustainability using accepted standards and methodologies, often using cost and quantities as determinants. It therefore lends itself to statistical analysis. LEED has effectively become the accepted standard for measuring green design in the United States; most project teams have the basic knowledge allowing them to understand the implications of the analysis undertaken here.

ANALYZING THE DATA - COST ANALYSIS OF SIMILAR BUILDINGS

To compare construction costs of buildings where LEED certification was a primary goal to similar buildings where LEED was not considered during design, we selected 45 library, laboratory, and academic classroom projects which were designed with a goal of meeting some level of the USGBC's LEED-NC certification, and compared them to 93 non-LEED buildings with similar program types. All costs were normalized for time and location in order to ensure consistency for the comparisons.

In a comparison between all projects, something interesting came to light: the cost per square foot for the LEED-seeking buildings was scattered throughout the range of costs for all buildings studied, with no apparent pattern to the distribution. Sample variation analysis tests indicated that there was no statistically significant difference between the LEED population and the non-LEED population. In other words, any variations in the samples, or the sample averages, were within the range to be expected from any random sample of the whole population. It is important to note, however, that the standard deviation in dollars per square foot cost for each category (LEED-seeking and non-LEED) was quite high, since there is such a wide variation in building costs.

To summarize the findings in these category comparisons, we found that there was no significant difference in the construction costs for LEED-seeking versus non-LEED buildings in any of the categories.

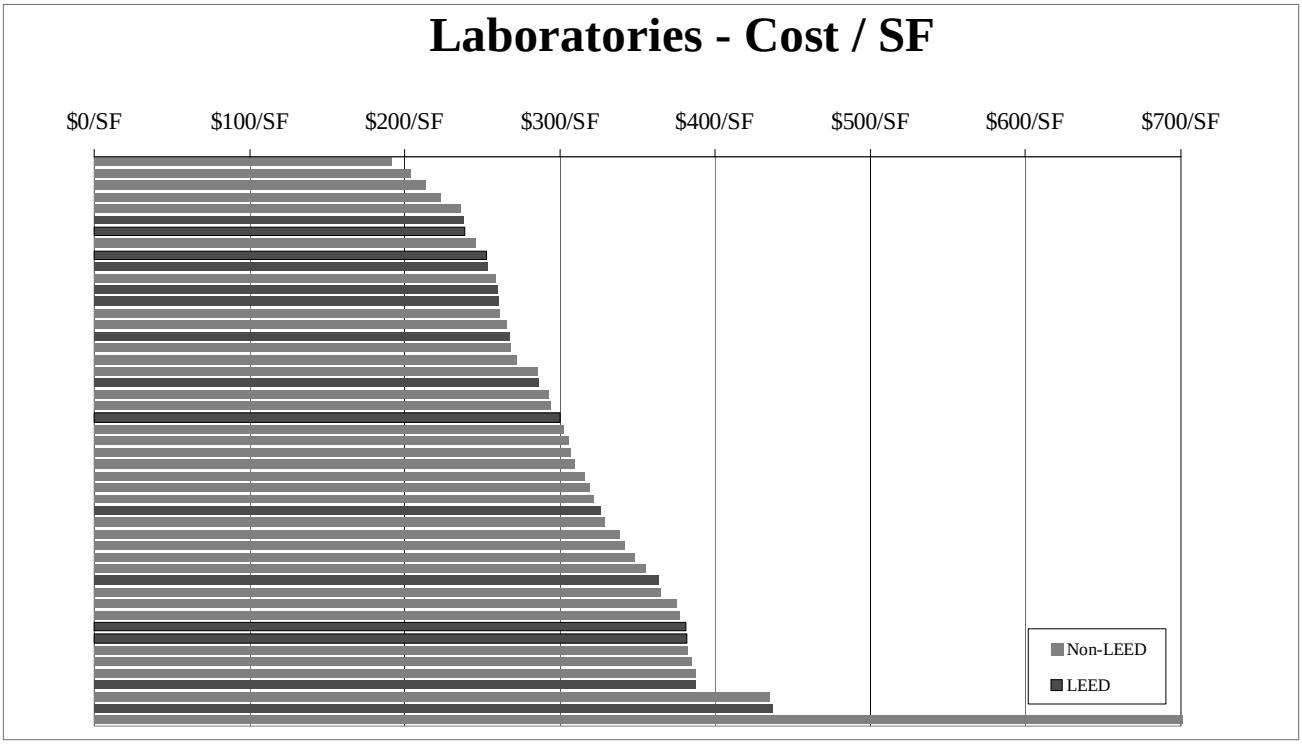
LEED-SEEKING VERSUS NON-LEED

Throughout these comparisons we have referred to the two groups as LEED-seeking and non-LEED. However, it is important to keep in mind that the difference between these groups is simply that the LEED-seeking buildings were designed with LEED certification in mind, while this was not one of the goals for the non-LEED buildings.

To compare LEED-seeking to non-LEED buildings, ten non-LEED buildings were selected at random from the 93 examined for this study. A LEED checklist was created for each of these ten buildings to determine the number and type of points each project would receive with their current design.

This analysis concluded that these non-LEED projects achieved between 15 and 25 points with their established designs, and in fact one project was estimated to qualify for 29 points – enough to earn a rating of LEED Certified if the building owners had so desired.

Closer examination of the LEED checklist suggests that for any building, there are usually about 12 points that can be earned without any changes to design, due simply to the building's location, program, or requirements of the owner or local codes. Up to 18 additional points are typically available for a minimum of effort, and little or no additional cost required.



COST ANALYSIS OF SIMILAR BUILDINGS – CONCLUSION

Our findings show that projects are achieving LEED within the same cost range as non-LEED buildings. However, it does not necessarily follow that a specific individual building will be able to achieve LEED at no added cost. Rather, the data suggests that there are many factors affecting cost in a building, and that LEED tends to have a lesser impact than other factors.

ANALYZING THE DATA – INITIAL BUDGET

One of the most common methods used to establish the cost of green has been to compare the final construction costs for the project to the established budget. In other words, was the budget increased to accommodate the sustainable elements, or were those elements incorporated into the project within the original available funds? Within the LEED seeking buildings we studied, we found that over half the projects had original budgets that were set without regard to sustainable design, and yet received no supplemental funds to support sustainable goals. Of those that did receive additional funding, the supplement was usually provided only for specific enhancements or requirements, such as photovoltaic systems, and the range of monies supplemented, for those few that required it, was typically in the range of 0 – 3% of initial budget. The projects that were the most successful in remaining within their original budgets were those which had clear goals established from the start, and which integrated the sustainable elements into the project at an early stage. Projects that viewed the elements as added scope, tended to experience the greater budget difficulties.

From this analysis we can conclude that many projects can achieve sustainable design within their initial budget, or with very small supplemental funding. This suggests that owners are finding ways to incorporate elements important to the goals and values of the project, regardless of budget, by making choices and value decisions.

FEASIBILITY AND COST

While in general LEED projects fall within the same cost range as non-LEED projects, it is also true that individual projects experience differences in LEED costs. The Davis Langdon analysis includes a breakdown of feasibility by LEED point.

Two of the most significant factors that can greatly influence the cost of green are:

COST DRIVERS

Intents / Values

Perhaps the single most significant factor in determining the feasibility of incorporating sustainable design into a building is the established intent and values of the building owner and project team. The best and most economical sustainable designs are ones in which the features are incorporated at an early stage into the project, and where the features are integrated, effectively supporting each other, and the owner has the ability and willingness to make decisions affecting aesthetics and operations in the interest of sustainability. If the owner has no expressed desire to incorporate elements of sustainable design, it becomes more difficult to incorporate the necessary modifications into the design.

This underscores the importance of understanding the actual intents and desires of the owner and the design team. If they are not actually serious, or are unwilling to invest the time and cooperation that may be needed, it will be much more difficult to reach the desired level of sustainability. This is likely to impact cost to build.

Bidding Climate

Another of the key factors in the cost of sustainable design is the response of bidders to the green requirements in the contract. There are some measurable direct costs to be borne by the contractor, including the cost of documentation of the material credits, the application of the construction indoor air quality credits, and some of the schedule impacts of post construction building flush-out. These, however, are relatively low costs.

A far greater impact comes where the contractor perceives the sustainable requirements as onerous or risky. Some construction contracts include phrases that transfer the liability for achieving LEED certification to the contractor. Clearly the contractor, when faced with this requirement, will include a greater risk contingency into their bid, if they are willing to bid at all. In order to manage the impact of sustainable design on bid response it is necessary to write reasonable specifications and contracts, and to engage the contractor in a collaborative process, possibly even including training and bonuses for compliance, rather than transferring risks and applying penalties for failure.

In areas where bidders are unfamiliar with building sustainable projects, they are likely to be more wary. This has two effects: firstly, bidders are inclined to add contingencies or risk premiums to cover the perceived risk; secondly, the bid pool diminishes, leading to poorer competition and higher bid prices. As bidding communities become more familiar with sustainable buildings, the risk premiums decrease, and the competition increases, reducing or eliminating the green premium.

The cost impact of bid climate is more pronounced when bidders have plenty of alternative work. When work is scarce, bidders are more willing to discount the risk in order to remain in business. For this reason it is essential to understand the bid community and the work availability.

Other factors that can influence sustainable design costs include: adequacy of starting budget, location, design standards, climate, timing of implementation, building size, point synergies, point feasibility, and design process.

FEASIBILITY AND COST - CONCLUSION

There are a number of factors which can have a significant impact on both the ability to achieve specific LEED points, and on the cost to build a sustainable building. When considering cost and feasibility for pursuing LEED certification for any building, it is extremely important to:

- Understand the feasibility of each point for the project
- Understand the factors affecting cost and feasibility

Having a comprehensive understanding of these factors allows an owner to more accurately determine potential costs, and to make better choices as to which LEED points a particular building should pursue.

BUDGETING METHODOLOGY FOR GREEN

When establishing a design and a budget for a LEED building, the key point to remember is that sustainability is a program issue, rather than an added requirement. Our analysis indicates that it is necessary to understand the project goals, the approach to achieving the goals, and the factors at play in for the project. Simply choosing to add a premium to a budget for a non-green building will not give any meaningful reflection of the cost for that building to meet its green goals. The first question in budgeting should not be "How much more will it cost?", but "How will we do this?"

This must be done as early as possible in the project and it must be considered at every step of design and construction.

ESTABLISH TEAM GOALS, EXPECTATIONS AND EXPERTISE

It is important to understand your team. The feasibility and potential cost impact of a number of LEED points can be significantly increased or decreased by whether or not the members of the design and construction teams are familiar with sustainable practices, and willing to commit to following established protocols and procedures. It is also important to ensure that the team includes the expertise that will be necessary to allow the sustainable elements to be incorporated smoothly. You must align the goals and values of the project such that all members of the team accept and understand them.

INCLUDE SPECIFIC GOALS

A LEED checklist should be prepared at the start of the project and at every program stage. This will enable the project team to clearly understand their current ability to meet the project's established goals and values. Additionally, the team should specify specific design measures to be employed in meeting the goals, and these should be routinely monitored to ensure complete compliance.

ALIGN BUDGET WITH PROGRAM

It is essential to align the budget with the program during the programming phase of the project. If there are insufficient funds to fulfill all of the program goals, either the goals must be reduced, or the budget increased. Too often projects move forward with a mismatch, either because the project team is unaware of the mismatch, or (more often) due to wishful thinking that something will turn up to resolve the problem.

In order to align the budget with the program, a cost model should be developed which allocates the available funds to the program elements. The cost model will both reflect the program – highlighting areas of shortfall – and provide planning guidance for the design team by distributing the budget across the disciplines.

The cost model also provides a communication tool for the project team, allowing clear understanding of any budget limitations. These must be addressed by adjusting scope, design or funds. Proceeding with inadequate funding will lead to more drastic scope reductions at later

stages in the design process, and greater conflict between competing interests in the program. It is in these cases that sustainable elements are most vulnerable to elimination as unaffordable expenses.

It is the choices made during design which will ultimately determine whether a building can be sustainable, not the budget set.

STAY ON TRACK

Once you have a clear understanding of the goals and values for the project, as well as the budget available, it is important to stay on track throughout the entire process. The steps for staying on track include beginning and maintaining any necessary documentation, updating and monitoring the LEED checklist, and using energy and cost models as design tools, preferably early in design.

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